

NON-PUBLIC?: N
ACCESSION #: 9103010259
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Byron, Unit 1 PAGE: 1 OF 04

DOCKET NUMBER: 05000454

TITLE: High Negative Flux Rate Reactor Trip due to Loss of Control Rod
Drive Power Supplies during Lightning Strike.
EVENT DATE: 08/19/90 LER #: 90-011-01 REPORT DATE: 09/13/90

OTHER FACILITIES INVOLVED: NONE DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 78

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: J. Schrock, Operating Engineer TELEPHONE: (815) 234-5441
Extension 2216

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

At 0425 on August 19, 1990, with severe lightning activity near Byron Station, a Unit 1 reactor trip occurred from 78% power. A lightning strike induced a voltage surge that activated nine out of ten over-voltage protection devices installed on power supplies in the rod drive (RD) AA! power cabinets. This activation released twelve out of fifteen rod control cluster assembly groups into the core and resulted in a high negative flux rate reactor trip.

Due to several Commonwealth Edison and industry wide lightning induced reactor trips, several modifications have previously been made to both the containment lightning protection system and the rod drive over voltage protectors.

The Rod Drive System will be further modified with a new model of power

supply that is less likely to cause a reactor trip after a transient caused by lightning.

This event is reportable pursuant to 10CFR50.73 (a)(2)(iv) as a result of the automatic actuation of the Reactor Protection System.

(0716R/0081R-2)

END OF ABSTRACT

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A. PLANT CONDITIONS PRIOR TO EVENT:

Event Date/Time 08-19-90 / 0425

Unit 1 MODE 1 - power operation Rx Power 78%
RCS AB! Temperature/Pressure normal operating

Unit 2 MODE 1 - power operation Rx Power 48%
RCS AB! Temperature/Pressure normal operating

B. DESCRIPTION OF EVENT:

AT 0425 on August 19, 1990, with severe lightning activity near Byron Station, a Unit 1 reactor trip occurred from 78% power due to power range IG! high negative flux rate. As expected after the trip, both Auxiliary Feedwater pumps (AF) BA! automatically started on Steam Generator Lo-2 level. The Unit was stabilized and recovered in accordance with Station emergency procedures with the reactor core temperature being controlled by main condenser steam dumps and steam generator level maintained by both the 1A Auxiliary Feedwater Pump and the Unit One Startup Feedwater Pump. The Unit was maintained in Mode 3 (Hot Standby). Mode 1 (power operations) was entered following a reactor startup on 8-20-90 at 1225.

No systems or components were inoperable at the beginning of this event which contributed to this event. Operator actions aided in restoring stable plant conditions after the event.

The NRC Operations Center was notified of the event at 0525 on 8-19-90, pursuant to 10CFR50.72(b)(2)(ii). An actuation of the Reactor Protection System is reportable pursuant to 10CFR50.73(a)(2)(iv).

C. CAUSE OF EVENT:

The Unit 1 five Rod Drive (RD) AA! power cabinets each contain two Lambda (model LME-24) +24Volt direct current (VDC) power supplies and two Lambda (model LCS-A24-6795) -24VDC power supplies. A unique feature common to the positive supplies are the Over-Voltage Protection (OVP) devices (Lambda model LMOV-3) designed to protect the power cabinet's internal circuitry. If the sensed output of a positive power supply exceeds +28VDC, the OVP device will activate. This activation will short the associated power supply and force the redundant power supply to pick up the cabinet load through auctioneering. Once the OVP device is "tripped", it can only be reset by de-energizing the shorted supply. Loss of both positive power supplies in a power cabinet through OVP activation will cause all the power cabinet's Rod Control Cluster Assemblies (RCCAs) to fall into the core and result in a reactor high negative flux rate trip.

Immediately prior to the reactor trip of this event, a lightning strike in the vicinity of Byron Station induced a voltage surge that activated nine out of ten Over-Voltage Protection devices installed on the positive 24 VDC power supplies in the Unit One RD power cabinets. This activation released twelve RCCA groups out of the total fifteen into the core. These groups then caused the Negative High Flux Rate trip which then released the remaining three RCCA groups held by the 2AC cabinet.

The most probable root cause of the OVP activations was lightning induced voltages on the RD system cabling. Due to the elusive nature of lightning and the unknown location of the lightning strike, the induced voltage carrier is unknown. The ground cables and lightning rods were verified intact on both units.

The positive power supplies themselves may have allowed passage of the voltage transient and contributed to this event. The RD power cabinet negative power supplies, which are not over-voltage protected, did not contribute to the cause of this event.

(0716R/0081R-3)

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D. SAFETY ANALYSIS:

There were no adverse safety consequences as a result of this event. The health and safety of the public was at no time endangered. Other equipment important to safety was not affected by the storm.

E. CORRECTIVE ACTIONS:

After a similar event in 1985, several corrective actions were implemented to prevent recurrence. Modification M6-1-85-0516 improved the containment lightning protection by bypassing the containment liner in the lightning protection system and routing directly to the ground grid. This modification seems to have abated lightning influences beyond the Rod Drive system.

After the 1987 successive Unit One lightning trips, Modification M6-1-87-105 changed Unit One Rod Drive grounding such that cabinets were not separately grounded but grounded only at two points. This grounding scheme reduced circulating currents and is consistent with the Unit Two configuration.

Additionally, per Commonwealth Edison Engineering and Westinghouse recommendations, surge protection has been added to the RD over-voltage protectors and the trip setpoints increased on both Units. On 04-15-88, 2200 pF capacitors were installed across the base to emitter of transistor Q1 within the OVP devices on Unit One. This installation is equivalent to Lambda model LMOV-3 "S-option" and should relieve low energy high frequency transients without activating the OVP device. On 2-16-90, Unit One OVP setpoints were changed from 26.5 Vdc to 28 Vdc.

On 10/21/90, Byron Nuclear Work Requests B80213 - B80222 were written to replace the Lambda LME-24 (+) 24 Vdc power supplies with Acopian model A24H1200 supplies. The Acopian supplies will prevent unwarranted reactor trips with an automatic "reset" function. Upon activation of an OVP device, the Acopian supplies will cut out and re-energize in 50mS. The Acopian supplies will then provide control power to the still stationary RCCAs if the initiating over voltage condition no longer exists.

The Acopian supplies are presently installed on the Unit Two Rod Drive System from the latest Unit Two refueling outage B2R02. The Unit One Acopian power supply changeout will occur prior to the completion of the the upcoming Unit One refueling outage B1R04. AIR # 91-030 tracks completion of this activity.

F. PREVIOUS OCCURRENCES:

Since 1985, the OVP devices on the power cabinet positive power supplies have tripped Unit One four times during thunderstorms. Below is a list of the events:

OVP

DATE UNIT ACTUATIONS LER

07-13-85 1 02 LER 85-068

07-29-87 1 09 LER 87-017

07-31-87 1 03 LER 87-017

08-19-90 1 09 LER 90-011

In all the above events, lightning caused a voltage surge sensed by the OVP devices which lead to their activation. Only the 1985 event caused additional damage beyond the Rod Drive system. Note also Unit Two has not experienced lightning induced reactor trips.

(0716R/0081R-4)

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In addition, similar events have occurred at Zion and Braidwood and throughout the industry. IE Information Notice 85-86, "Lightning Strikes at Nuclear Power Generating Stations," included events at Zion and Byron and the corrective actions as a result of the 7-13-85 trip.

G. COMPONENT FAILURE DATA:

Component failure did not initiate this event, nor did any failures result from this event.

(0716R/0081R-5)

ATTACHMENT 1 TO 9103010259 PAGE 1 OF 2

Commonwealth Edison
Byron Nuclear Station
4450 North German Church Road
Byron, Illinois 61010

February 21, 1991

Ltr: BYRON 91-0110

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Dear Sir:

The enclosed supplemental Licensee Event Report from Byron Generating Station is being transmitted to you in accordance with the requirements of 10CFR50.73(a)(2)(iv).

This report is number 90-011; Docket No. 50-454.

Sincerely,

R. Pleniewicz
Station Manager
Byron Nuclear Power Station

RP/DK/mw

Enclosure: Licensee Event Report No. 90-011

cc: A. Bert Davis, NRC Region III Administrator
W. Kropp, NRC Senior Resident Inspector
INPO Record Center
CECo Distribution List

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ATTACHMENT 1 TO 9103010259 PAGE 2 OF 2

SUPPLEMENT TO DVR

DVR NO.
D- 06 - 01 - 90 - 109
STA UNIT YEAR NO.

PART 1 TITLE OF EVENT OCCURRED

High Negative Flux Rate Reactor Trip due to Loss 08/19/90 0425
of Control Rod Drive Power Supplies during DATE TIME
Lightning Strike
REASON FOR SUPPLEMENTAL REPORT
Supplemental Corrective Actions.

PART 2
ACCEPTANCE BY STATION REVIEW

DATE

SUPPLEMENTAL REPORT APPROVED
AND AUTHORIZED FOR
DISTRIBUTION
STATION MANAGER DATE

(0716R/0081R-1)

*** END OF DOCUMENT ***
